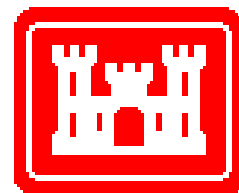




**U.S. Army Corps of Engineers**  
**Alaska District**  
**Soils and Geology Section**



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# **TRIAL DREDGING REPORT**

**Anchorage Harbor Deepening**  
**Port of Anchorage, Alaska**




**November 2008**

November 2008


MEMORANDUM FOR CEPOA-CO-O (Allen Churchill)


SUBJECT: Trial Dredging Report, Anchorage Harbor Deepening Project at the Port of Anchorage, Alaska.

1. Enclosed is the final Trial Dredging Report for the Anchorage Harbor Deepening Project at the Port of Anchorage, Alaska. Included with the report are the project location and vicinity map, the trial dredge area location map, test boring logs from the 2008 Geotechnical Findings Report, trial dredge area surveys, and a discussion of the soils and conditions encountered while dredging.
2. Questions should be addressed to John Rajek at 753-5695 or Chuck Wilson at 753-2687.

 11-19-08  
JAMES W. PEKAR, P.E.  
Chief, Geotechnical Services

CONCUR:

Wilson 

Carpenter 

Palmer 

Rajek 

**TRIAL DREDGING REPORT**  
**Anchorage Harbor Deepening**  
**Port of Anchorage, Alaska**  
**November 2008**

**TABLE OF CONTENTS**

TITLE PAGE	Page
TABLE OF CONTENTS.....	i
LIST OF FIGURES .....	i
LIST OF APPENDICES.....	i
J.E. McAmis Trial Dredge Area 1.....	2
The Dutra Dredging Company Trial Dredge Area 2.....	5
The Dutra Dredging Company Trial Dredge Area 3.....	8

**LIST OF FIGURES**

Project Location and Vicinity Map .....	Figure 1
Trial Dredging Area Location Map .....	Figure 2

**LIST OF APPENDICES**

APPENDIX A – EXPLORATION LOGS	
Exploration Logs AP-4590, AP-4607, and AP-4611 .....	3 Pages
APPENDIX B – MCAMIS TRIAL DREDGE AREA SURVEYS	
J.E. McAmis Trial Dredge Area Surveys.....	3 Pages
APPENDIX C – DUTRA TRIAL DREDGE AREA SURVEYS	
The Dutra Dredging Company Trial Dredge Area Surveys .....	4 Pages
APPENDIX D – TRIAL DREDGING PHOTOGRAPHS	
Additional photographs of dredging operations .....	9 Pages

**TRIAL DREDGING REPORT**  
**Anchorage Harbor Deepening**  
**Port of Anchorage, Alaska**  
**November 2008**

A trial dredging program was conducted in virgin areas (no previous dredging) where future dredging is planned for the Anchorage Harbor Deepening project. Trial dredging is not a normal undertaking; however, in this case, very dense sands and gravels containing cobbles and boulders and lean clay deposits were encountered during the U.S. Army Corps of Engineers–Alaska District’s (USACE-AD) previous marine geotechnical exploration for the project. These subsurface conditions were of concern to dredging feasibility. Therefore, this trial program was developed to evaluate these problematic conditions within the virgin areas. The objectives of the program were to procure data to estimate dredging production rates, evaluate the suitability of dredging equipment, and provide a direct observation of subsurface conditions within the virgin areas where future dredging is planned. This report documents the results of the trial dredging efforts.

The basic trial dredging program consisted of dredging at three different locations to an elevation of -45 feet mean lower low water (MLLW). These areas were selected at test boring locations drilled during a previous marine geotechnical investigation. Geotechnical descriptions of the soil conditions encountered during that investigation are presented in the report titled: “Geotechnical Findings Report, Anchorage Harbor Deepening, Port of Anchorage, Alaska” USACE-AD, June 2008.

Two contractors conducted the trial dredging: J.E. McAmis, Inc. and The Dutra Dredging Company. A project location and vicinity map along with a map showing the locations of each trial dredging area can be found as Figures 1 and 2, respectively. A summary showing the dredge area reference numbers, dredging contractors, and reference test boring exploration logs is reported in Table 1 and test boring exploration logs are provided in Appendix A. When comparing the results of these trial dredging efforts with test boring exploration logs, it should be noted that it was not possible to determine the amount or maximum size of cobbles or boulders encountered during the drilling program due to the type and size of sampling equipment used.

**Table 1: Trial Dredging Areas**

Trial Dredging Area	Dredging Contractor	Reference Test Boring Exploration Log
TDA-1	J.E. McAmis, Inc.	AP-4607
TDA-2	The Dutra Dredging Company	AP-4611
TDA-3	The Dutra Dredging Company	AP-4590

**J.E. McAmis Trial Dredge Area 1**

On 17 July 2008, J.E. McAmis used the Megan-Renee dredging barge and its Komatsu PC3000 Aquadigger excavator to dredge in the northern virgin dredge area near the location of test boring AP-4607. The Megan-Renee dredging barge was equipped with three 95-foot spuds to keep the barge in place while dredging. The excavator had a 10-cubic yard bucket and an approximate digging capability of 65 feet below the barge deck. Photograph 1 shows the barge and backhoe working at trial dredge area 1. Additional photographs of the McAmis dredging operations are presented in Appendix D.



Photograph 1: McAmis's Megan-Renee dredging barge and Komatsu PC3000 Aquadigger.

McAmis's crew worked two 12-hour shifts at this location and dredged a total volume of approximately 7,940 cubic yards of material. Dredged material was loaded into the Sand Island split-barge dump scow and taken to the approved off-shore disposal site. The surface layer of gravel with silt, sand, and cobbles (GP-GM) was initially very difficult to break through. The volume of cobbles was estimated at 10 percent or less within this soil layer during the trial dredging. Sand with silt (SP-SM) was encountered below the surface layer of gravel. Photograph 2 shows an example of this soil unit encountered while dredging. The estimated yield of material dredged in each 10-cubic yard bucket was between 80 to 100 percent (8 to 10 cubic yards in a 10-cubic yard bucket). After a large dredging area was established, the side slopes of the excavation in the very dense sands with silt (SP-SM) began to slough to a limited extent into the area being excavated. Below the approximate elevation of -40 feet MLLW occasional layers of lean clay (CL) were encountered while dredging.

Boulders with a maximum dimension of six feet were encountered in trial dredge area 1. The estimated volume of boulders encountered while dredging was five percent or less. Photographs 2, 3, and 4 provide an example of the boulders encountered while dredging. This confirms that boulders are present within the proposed new work dredging areas. Survey information collected after the trial dredging was completed is provided in the Appendix B.



Photograph 2: Example of sand with silt (SP-SM) containing cobbles and boulders encountered at trial dredge area 1 (AP-4607).





Photograph 3: Boulders and cobbles encountered while dredging at trial dredge area 1 (AP-4607).



Photograph 4: Six-foot diameter boulder encountered while dredging at trial dredge area 1 (AP-4607).

## **The Dutra Dredging Company Trial Dredge Area 2**

On 16 September 2008, The Dutra Dredging Company used the Paula Lee dredging barge with a crane and clam shell bucket to dredge in the southern virgin dredge near the location of test boring AP-4611. Photograph 5 shows the Paula Lee dredging barge and crane. Additional photographs of the Dutra dredging operations are presented in the Appendix D.



Photograph 5: Dutra's Paula Lee dredging barge and crane.

The Paula Lee dredging barge was equipped with two spuds and four anchors to keep the barge in place while dredging. Dutra's crew worked approximately 18 hours at this location and dredged a total volume of approximately 3,400 cubic yards of material. Dredged material was loaded into the split-barge Scow No. 5 and taken to the approved off-shore disposal site. Initially a 20-cubic yard Atlas clam-shell bucket weighing 30,000 pounds was used to remove the soft marine deposits of silt and silty sand (ML, SM) at the surface. The wet density of this soil was measured at 118.2 pounds per cubic foot. After the surface layer of soft or loose soils was removed, a 10-cubic yard Owens clam-shell bucket, weighing 54,000 pounds, was used to dredge the very dense clayey gravel with sand and cobbles (GC) encountered below the recent marine deposits. Photograph 6 shows the Owens 10-cubic yard bucket. Dredging the very dense clayey gravel with sand, cobbles, and boulders (GC) proved difficult; the material recovered from each effort with the 10-cubic yard bucket was low with an estimated yield of 30 to 50 percent.





Photograph 6: View of 10-cubic yard Owens clam-shell bucket weighing 54,000 pounds.

The wet density of this soil was measured at 128.6 pounds per cubic foot. The estimated volume of cobbles was 10 percent or less within this soil layer. A boulder with the approximate dimensions of 2 feet wide, 3 feet long, and 1 foot thick was dredged near elevation -25 feet MLLW. This boulder, shown in Photograph 7, had angular and fresh fractured faces indicating it was only a portion of a larger boulder. Firm lean clay (CL) was encountered below approximate elevation -28 feet MLLW. The wet density of this material was measured at 123.8 and 115.6 pounds per cubic foot. The material recovered during each effort with the 10-cubic yard bucket increased in the clay soils to an estimated yield of 70 to 100 percent. There was no difficulty in emptying the bucket and releasing the lean clay into the dump scow. The dredge area side slopes within the clay soils did not appear to slough while dredging. Photograph 8 shows the lean clay encountered below -28 feet MLLW.



Photograph 7: Boulder encountered while dredging near elevation -25 feet MLLW at trial dredge area 2 (AP-4611).



Photograph 8: Firm lean clay (CL) encountered below approximate elevation -28 feet MLLW while dredging at trial dredge area 2 (AP-4611).

### **The Dutra Dredging Company Trial Dredge Area 3**

On 23 September 2008, Dutra dredged near the location of test boring AP-4590 in the northern virgin dredge area. Dutra's crew worked two 12-hour shifts at this location and dredged a total volume of approximately 2,000 cubic yards of material. Dredged material was loaded into the split-barge Scow No. 5 and taken to the approved off-shore disposal site. Dredging was very difficult; initially the 20-cubic yard Atlas clam-shell bucket, weighing 30,000 pounds, was used with little or no recovery of material. This bucket was immediately replaced with the 10-cubic yard Owens clam-shell bucket weighing 54,000 pounds. The volume of material recovered from each 10-cubic yard bucket was very low with an estimated yield of 10 percent or less. Photograph 9 shows the typical amount of material recovered just below mud line. The wet density of gravel with silt, sand, and cobbles (GP-GM) encountered near the surface was measured at 148.4 pounds per cubic foot. The volume of cobbles at this location was estimated at 10 percent or less within this soil layer.



Photograph 9: Example of low material recovery using the 10-cubic yard Owens bucket while dredging near the surface at trial dredge area 3 (AP-4590).

Below the dense surface gravels the material changed to clayey sand with gravel and cobbles (SC) and clayey gravel with sand and cobbles (GC). The wet density of this material was measured between 125.2 and 144.6 pounds per cubic foot with an average density of 133.2 pounds per cubic foot. The estimated volume of cobbles was five percent or less within this soil layer.

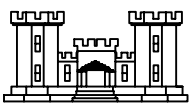
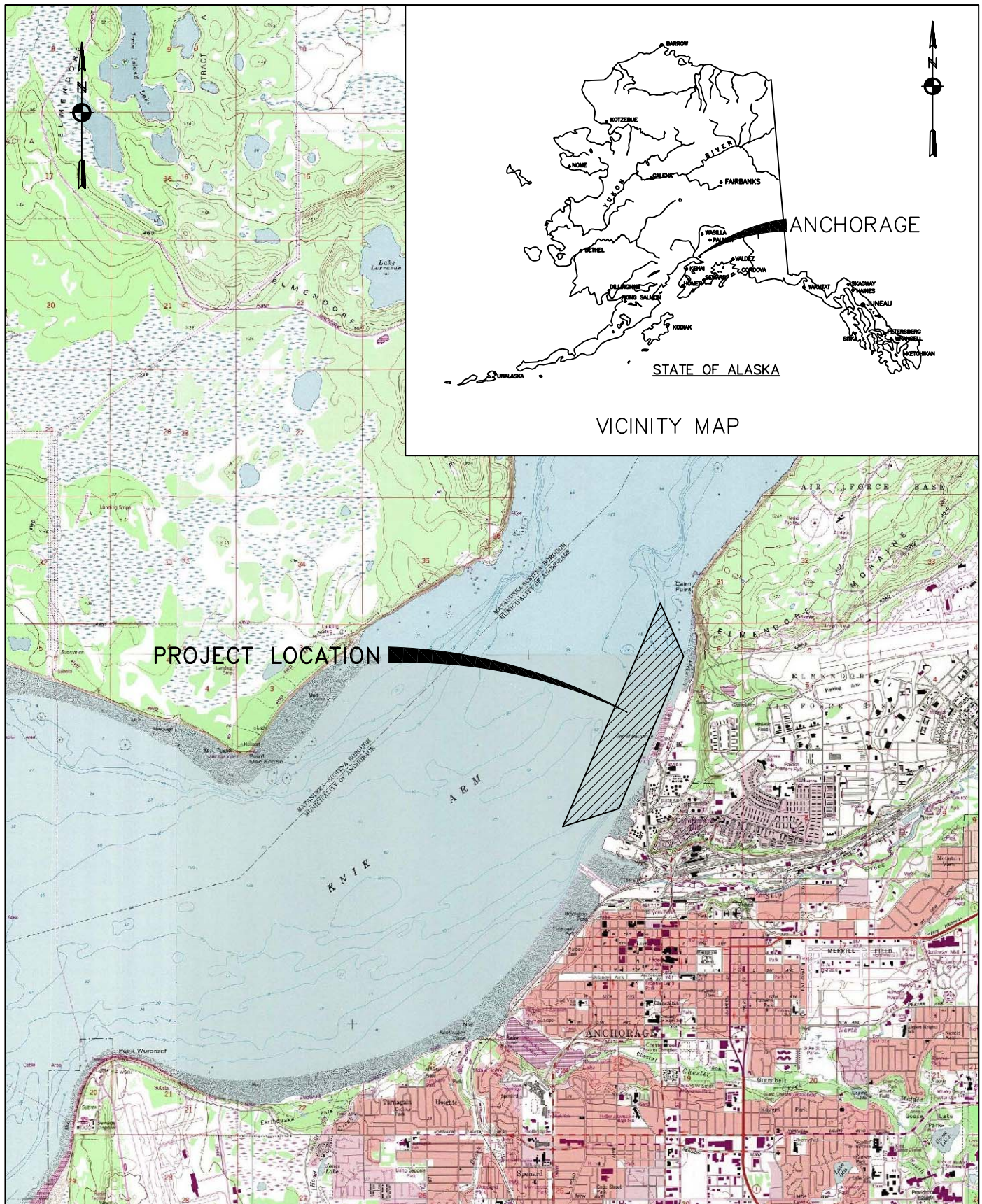


The material recovered from each bucket did increase with depth to an estimated yield between 10 and 40 percent. Photograph 10 shows an example of clayey gravel (GC) and clayey sand (SC) and the typical amount of material recovered using the 10-cubic yard Owens bucket. The dredge area side slopes within these soils did not appear to slough while dredging. Survey information collected after the trial dredging was completed is provided in Appendix C.



Photograph 10: An example of clayey gravel (GC) and/or clayey sand (SC) dredged at trial dredge area 3 (AP-4590). Note the amount of material recovered in a typical pass with the 10-cubic yard Owens bucket.





ALASKA DISTRICT  
CORPS OF ENGINEERS  
SOILS AND GEOLOGY

PROJECT LOCATION AND VICINITY MAP  
ANCHORAGE HARBOR DEEPENING  
PORT OF ANCHORAGE, ALASKA

SCALE: NTS  
DATE: MAY 2008  
DRAWN/RVW: JR/CW  
FIGURE 1



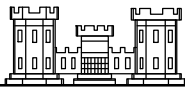




## **APPENDIX A**

### **EXPLORATION LOGS**

Exploration Logs AP-4590, AP-4607, and AP-4611.....3 Pages



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Anchorage Harbor Deepening**  
**Port of Anchorage, Alaska**

Page 1 of 1

Date: **29 Sep 2007**

Drilling Agency: ☐ Alaska District  
☒ Other **Gregg Drilling / Fugro Jack-Up Barge**

Datum: Vertical **MLLW**  
Horizontal **NAD83**

Location: Northing: **2,650,365 ft.**  
Easting: **1,660,221 ft.**

Top of Hole  
Elevation: **-25.3 ft.**

Hole Number, Field: **TB-7**  
Permanent: **AP-4590**

Operator:  
**Walter Mahousky**

Inspector:  
**Inocencio Roman/Greg Carpenter**

Type of Hole: ☒ other **Mud Rotary**  
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater:  
**Drilled Below Water**

Depth Drilled:  
**36.5 ft.**

Total Depth:  
**38.5 ft.**

Hammer Weight:  
**140 lbs**

Split Spoon I.D.:  
**1.375 in.**

Size and Type of Bit:  
**4 in. I.D. x 4.5 in. O.D. HWT Casing**

Type of Equipment:  
**Mobile B-80 w/ Automatic Hammer**

Type of Samples:  
**Drive**

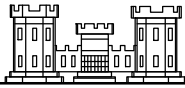
Depth (ft.)	Lithology	Sample Recovery ASTM D 4083 Frozen	Frost Class. ufc3-250-01fa	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size				Max Size (in.)	PID (ppm)	% Water	Description and Remarks Jack-Up Barge Deck Elevation: 38.2 ft.
							%Gravel	%Sand	%Fines	% Finer 0.02mm				
5		1		14 16 20 13	GP- GM	Poorly graded GRAVEL with Silt and Sand	60	29	11		>1.4			Grey, wet, subangular to subrounded gravel, fine to coarse sand, low plasticity fines, gravel fractured while driving
		2		9 14 14 24	ML	SILT with Gravel					1		19	Grey, wet, subrounded gravel, fine sand, Atterberg Limits-Nonplastic
10		3		40 42 40 41	SC	Clayey SAND with gravel	24	48	28		1.25			Grey, wet, subangular to subrounded gravel, fine to coarse sand, medium plasticity fines, gravel fractured while driving
15		4		50/5in.	GC	Clayey GRAVEL with Sand					>1.4			Grey, wet, subangular to subrounded gravel, fine to coarse sand, medium plasticity fines, gravel fractured while driving
20		5		30 52 45 44	GC	Clayey GRAVEL with Sand	44	39	17		1.25			Grey, wet, subangular to subrounded gravel, fine to coarse sand, medium plasticity fines, gravel fractured while driving
25		6		17 17 29 29	SC	Clayey SAND with gravel					0.75			Grey, wet, subangular to subrounded gravel, fine to coarse sand, medium plasticity fines, gravel fractured while driving
30		7		13 14 18 30	CL	Lean CLAY					0.5			Grey, wet, subangular gravel, fine sand, medium plasticity fines
35		8		15 7 12 19	CL	Lean CLAY					0.5			Grey, wet, subangular gravel, fine sand, medium plasticity fines
40														Bottom of Hole 38.5 ft. Elevation -63.8 ft. Drilled Below Water PID = (Cold/Hot) Photo Ionization Detector
45														

\* Indicates Estimated Frost Classification

Project: **Anchorage Harbor Deepening**

Hole Number:  
**AP-4590**

EXPLORATION LOG ANCHORAGE.GPJ ACE\_ANC.GDT 28/5/08



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Anchorage Harbor Deepening**  
**Port of Anchorage, Alaska**

Page 1 of 1

Date: **26 Sep 2007**

Drilling Agency: ☐ Alaska District  
☒ Other **Gregg Drilling / Fugro Jack-Up Barge**

Datum: Vertical **MLLW**  
Horizontal **NAD83**

Location: Northing: **2,649,256 ft.**  
Easting: **1,660,382 ft.**

Top of Hole  
Elevation: **-20.9 ft.**

Hole Number, Field: **TB-25**  
Permanent: **AP-4607**

Operator:  
**Walter Mahousky**

Inspector:  
**Greg Carpenter**

Type of Hole: ☒ other **Mud Rotary**  
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater:  
**Drilled Below Water**

Depth Drilled:  
**37.0 ft.**

Total Depth:  
**39.0 ft.**

Hammer Weight:  
**140 lbs**

Split Spoon I.D.:  
**1.375 in.**

Size and Type of Bit:  
**4 in. I.D. x 4.5 in. O.D. HWT Casing**

Type of Equipment:  
**Mobile B-80 w/ Automatic Hammer**

Type of Samples:  
**Drive**

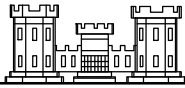
Depth (ft.)	Lithology	Sample Recovery ASTM D 4083 Frozen	Frost Class. ufc3-250-01fa	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size				Max Size (in.)	PID (ppm)	% Water	Description and Remarks Jack-Up Barge Deck Elevation: 37.1 ft.
							%Gravel	%Sand	%Fines	% Finer 0.02mm				
5		1		18 21 24 18	GP- GM	Poorly graded GRAVEL with Silt and Sand	70	24	6		1			Grey, wet, subrounded gravel, fine to coarse sand, nonplastic (NP) fines
10		2		7 17 24 34	SP- SM	Poorly graded SAND with Silt	2	91	7		0.25			Grey, wet, fine to medium sand, NP fines
15		3		18 26 38 47	SP- SM	Poorly graded SAND with Silt	0	93	7					Grey, wet, fine sand, NP fines
20		4		12 23 26 30	SM	Silty SAND	0	83	17					Grey, wet, fine to medium sand, NP fines
25		5		18 41 57	SP- SM	Poorly graded SAND with Silt	1	92	7		0.25			Grey, wet, fine to medium sand, NP fines
30		6		23 32 47	SP- SM	Poorly graded SAND with Silt	1	91	8		0.25			Grey, wet, fine to medium sand, NP fines, three inch layer of lean clay at 28 feet
35		7		27 35 47	CL	Lean CLAY						27		Grey, wet, Atterberg Limits-LL=27, PI=10
40		8		16 27 32 38	SM	Silty SAND								Grey, wet, fine sand, NP fines
45														Bottom of Hole 39.0 ft. Elevation -59.9 ft. Drilled Below Water PID = (Cold/Hot) Photo Ionization Detector

\* Indicates Estimated Frost Classification

Project: **Anchorage Harbor Deepening**

Hole Number:  
**AP-4607**

EXPLORATION LOG ANCHORAGE.GPJ ACE\_ANC.GDT 28/5/08



ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

Soils and Geology Section  
**EXPLORATION LOG**

Project: **Anchorage Harbor Deepening  
Port of Anchorage, Alaska**

Page 1 of 1

Date: **18 Sep 2007**

Drilling Agency: ☐ Alaska District  
☒ Other **Gregg Drilling / Fugro Jack-Up Barge**

Datum: Vertical **MLLW**  
Horizontal **NAD83**

Location: Northing: **2,642,574 ft.**  
Easting: **1,658,253 ft.**

Top of Hole  
Elevation: **-17.6 ft.**

Hole Number, Field: **TB-29**  
Permanent: **AP-4611**

Operator:  
**Walter Mahousky**

Inspector:  
**Robert Weakland**

Type of Hole: ☒ other **Mud Rotary**  
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater:  
**Drilled Below Water**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**34.3 ft.**

Hammer Weight:  
**140 lbs**

Split Spoon I.D.:  
**1.375 in.**

Size and Type of Bit:  
**4 in. I.D. x 4.5 in. O.D. HWT Casing**

Type of Equipment:  
**Mobile B-80 w/ Automatic Hammer**

Type of Samples:  
**Drive**

Depth (ft.)	Lithology	Sample Recovery	ASTM D 4083 Frozen	Frost Class. ufc3-250-01fa	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size				Max Size (in.)	PID (ppm)	% Water	Description and Remarks Jack-Up Barge Deck Elevation: 32.2 ft.
								%Gravel	%Sand	%Fines	% Finer 0.02mm				
5		1			12 17 24 50/0in.	GC	Clayey GRAVEL with Sand	48	36	16		1			Grey, wet, angular to subangular gravel, fine to coarse sand, medium plasticity fines
10		2			2 5 0	CL	Lean CLAY						23		Grey, wet, Atterberg Limits-LL=40, PI=18, 0.75 TSF indicated on pocket penetrometer
15		VST													Undrained Shear Strength = 1.403 kip/ft <sup>2</sup> Remolded Undrained Shear Strength = 0.649 kip/ft <sup>2</sup>
20		3			0 0 3 6	CL	Lean CLAY						26		Undrained Shear Strength = 1.558 kip/ft <sup>2</sup> Remolded Undrained Shear Strength = 0.587 kip/ft <sup>2</sup> Grey, wet, Atterberg Limits-LL=39, PI=15, 1.25 TSF indicated on pocket penetrometer
25		VST													Undrained Shear Strength = 1.636 kip/ft <sup>2</sup> Remolded Undrained Shear Strength = 0.685 kip/ft <sup>2</sup>
30		4			0 0 3 5	ML	SILT						24		Undrained Shear Strength = 1.945 kip/ft <sup>2</sup> Remolded Undrained Shear Strength = 0.634 kip/ft <sup>2</sup> Grey, wet, Atterberg Limits-Nonplastic, 1.5 TSF indicated on pocket penetrometer
35		VST													Undrained Shear Strength = 1.034 kip/ft <sup>2</sup> Remolded Undrained Shear Strength = 0.496 kip/ft <sup>2</sup> Bottom of Hole 34.3 ft. Elevation -51.9 ft. Drilled Below Water PID = (Cold/Hot) Photo Ionization Detector Vane Shear Test (VST): ASTM D2573 Vane Size(D x H): 55mmx110mm rectangular
40															
45															

\* Indicates Estimated Frost Classification

Project: **Anchorage Harbor Deepening**

Hole Number:  
**AP-4611**

EXPLORATION LOG ANCHORAGE.GPJ ACE\_ANC.GDT 28/5/08

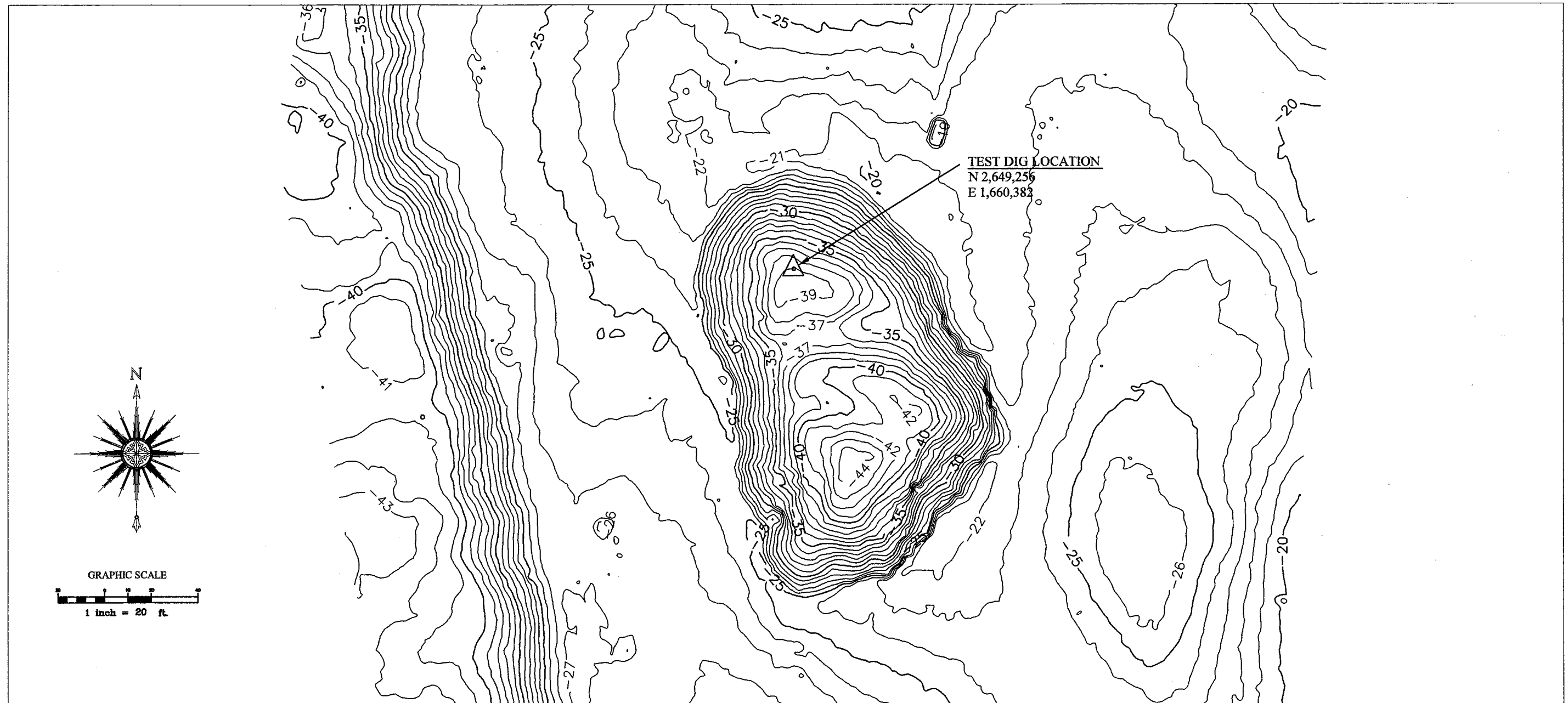
**APPENDIX B**  
**MCAMIS TRIAL DREDGE AREA SURVEYS**

J.E. McAmis Trial Dredge Area Surveys .....2 Pages

**J.E McAMIS - U.S Army Corps of Engineers**  
**Port of Anchorage Expansion Test Dig**  
**Post-Dredge Hydrographic Survey**  
**July 18, 2008**

**RECEIVED**  
**NOV 14 2008**  
 OFFICE OF  
 J. E. McAMIS, INC.

DATA COLLECTED: JULY 18, 2008  
 DRAWING DATE: JULY 18, 2008



- NOTES:**
1. HORIZONTAL DATUM: NORTH AMERICAN DATUM OF 1983, STATE PLANE COORDINATES, ALASKA ZONE 4.
  2. UNITS: U.S. SURVEY FEET.
  3. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW). SOUNDINGS ARE IN FEET AND INDICATE ELEVATIONS IN RELATION TO MLLW BASED UPON NOAA/NOS TIDAL BENCHMARK 9485920 ANCHORAGE, KINK ARE, COOK INLET, ALASKA.
  4. CONTOUR INTERVAL: 1 FOOT.
  5. ALL HORIZONTAL POSITIONING AND VESSEL ATTITUDE WAS PROVIDED IN REAL TIME USING A CODA OCTOPUS F-185+ GPS AIDED INERTIAL SENSOR.
  6. SOUNDINGS WERE COLLECTED USING A KONGSBERG EM3002 MULTIBEAM SONAR WITH A 300 MHZ, 130-DEGREE SWATH. DATA PROCESSING WAS COMPLETED USING HYPACK HYDRED SOFTWARE.
  7. THIS BATHYMETRIC SURVEY IS REPRESENTATIVE OF THE GENERAL CONDITION OF THE SEAFLOOR BOTTOM AT THE TIME OF THE SURVEY. THE CONDITION OF THE BOTTOM MAY CHANGE AT ANY TIME AFTER THE DATE OF THIS SURVEY.
  8. ALL BATHYMETRIC DATA WAS COLLECTED IN ACCORDANCE WITH THE U.S. ARMY CORPS OF ENGINEERS HYDROGRAPHIC SURVEY MANUAL, DA-112-02-1003 (JANUARY 2002). SURVEY CLASSIFICATION: NAVIGATION AND DREDGING SUPPORT SURVEYS, BOTTOM CLASSIFICATION OF SOFT.

THIS HYDROGRAPHIC SURVEY WAS COMPLETED BY AN AMERICAN CONGRESS ON SURVEYING AND MAPPING CERTIFIED HYDROGRAPHER.

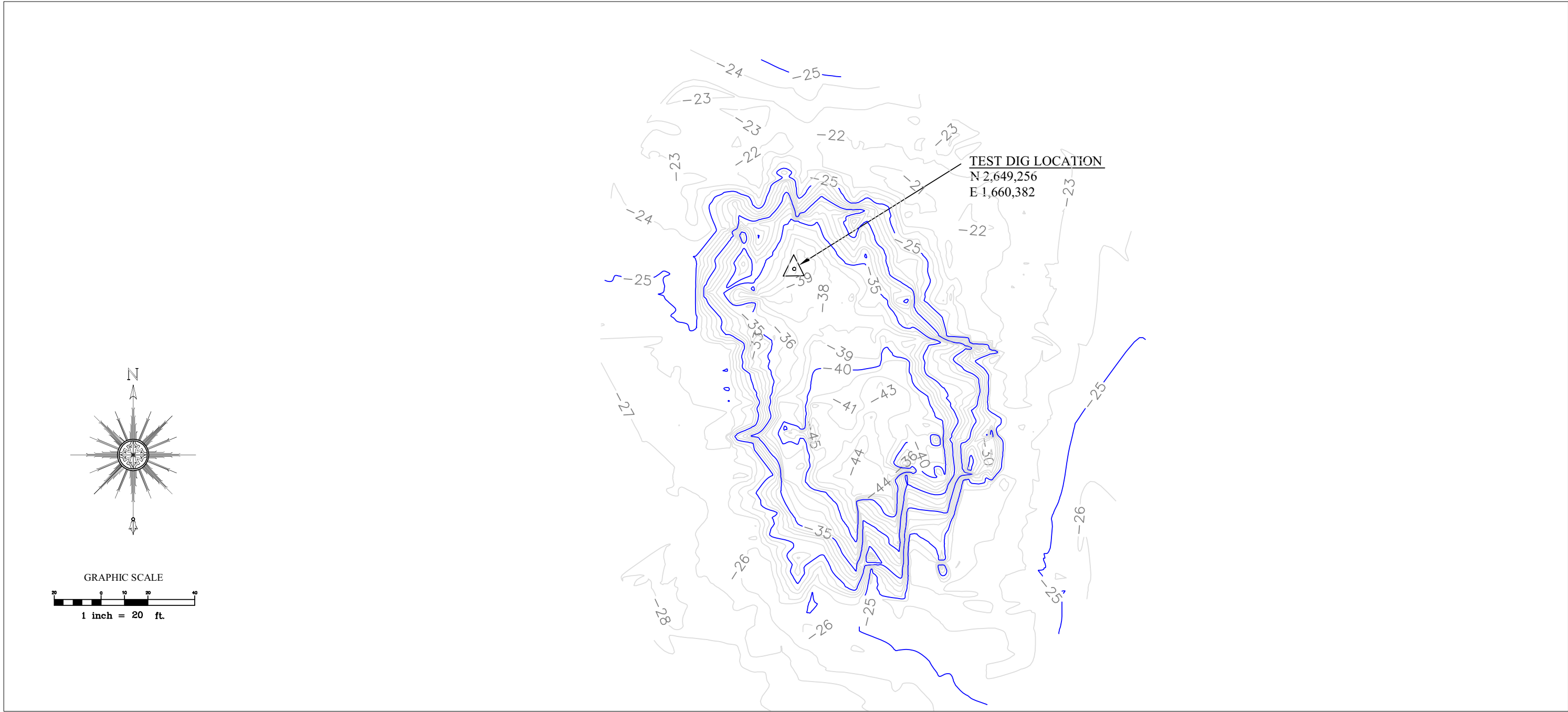
*James W. Glaeser* 11/11/08  
 JAMES W. GLAESER  
 AMERICAN CONGRESS ON SURVEYING AND MAPPING  
 CERTIFIED HYDROGRAPHER #222



**NORTHWEST HYDRO INC.**  
 31 COUGAR CREEK RD.  
 SKAMANIA, WA 98648  
 PH (509) 427-5081  
 EMAIL: NWHYDRO@SAW.NET



**J.E McAMIS - U.S Army Corps of Engineers**  
**Port of Anchorage Expansion Test Dig**  
**1-week Post-Dredge Hydrographic Survey**



SURFACE TO SURFACE VOLUME REPORT

JEM - USACE Test Dig / Port of Anchorage Expansion / July 17, 2008

Final Dredge Quantity

\

Project: C:\Northwest Hydro\jobs\2008\08-013 JEM ICRC Anchorage\USACE Test Dig\  
Tmodel\USACE Test Dig.pro

Report Generated: Friday, July 18, 2008 10:05:19 AM

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Where the second surface is above the first the volume is reported as fill.  
Where the second surface is below the first the volume is reported as  
excavation.

-----

Shrinkage/swell factors:	Excavation	1.0000	Fill	1.0000
First Surface	Number	Second Surface	Number	
Layer Name	of Points	Layer Name	of Points	
-----	-----	-----	-----	
PRE	17,224	POST	23,984	

Volume limited to that within the constraining boundary - Object 41663  
Area within boundary: 24,110.44 Sq. Ft. (0.5535 Acres)  
Total triangulated area: 24,110.48 Sq. Ft. (0.5535 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
-----	-----
7,938.5	

**APPENDIX C**  
**DUTRA TRIAL DREDGE AREA SURVEYS**

The Dutra Dredging Company Trial Dredge Area Surveys.....4 Pages

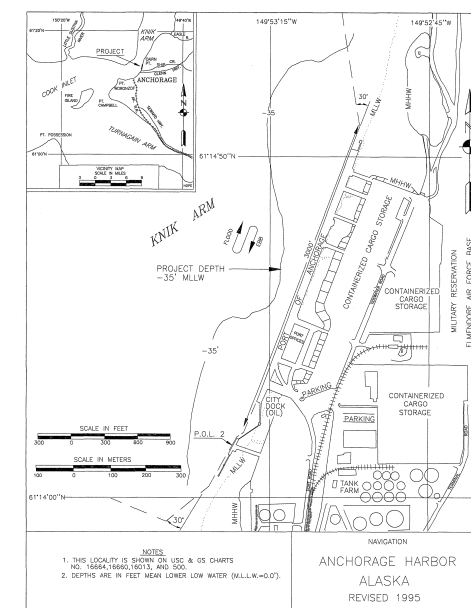
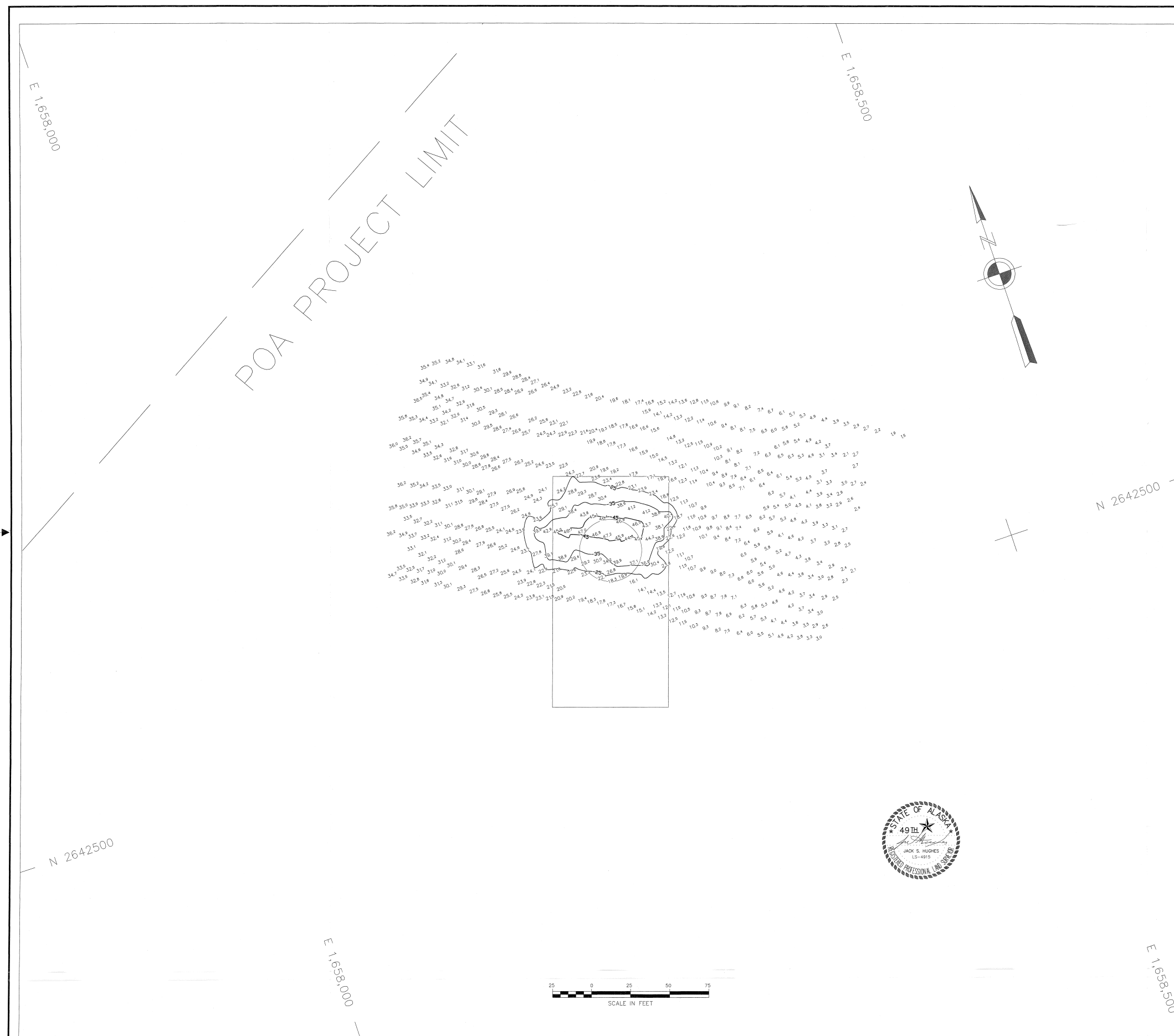


1. HORIZONTAL CONTROL IS ALASKA STATE PLANE, NAD 83, ZONE 4, IN FEET, HOLDING USACE SBC "N, END, 1978" AS N 2,646,652.19, E 1,660,582.43 AND USACE SBC "S, END, 1978" AS N 2,644,298.25 E 1,659,725.47.
2. VERTICAL CONTROL IS IN FEET, REFERRING TO MEAN LOWER LOW WATER (MLLW=0.0'), HOLDING NOAA/NOS TIDAL BENCH MARK LIST DATED 03 NOVEMBER 1999, WITH "BM-16, 1966" GIVEN AS 40.49', "BM-15, 1966" GIVEN AS 37.10', AND "BM-B-75" GIVEN AS 36.78'.
3. SOUNDINGS WERE CONDUCTED ON SEPTEMBER 17, 2008 USING AN INSPERFACE 448 SINGLE BEAM ECHO SOUNDER WITH A 200KHZ, 3 DEGREE BEAM-WIDTH TRANSDUCER. SOUND VELOCITY THROUGH THE WATER COLUMN WAS DETERMINED USING AN ODEIM DIGIBAR PRO AND A CONVENTIONAL 60 BAR CHECK TIDE CORRECTION WERE PROVIDED BY A TRIMBLE 5700 RIK RECEIVER AND CHECKED BY CONVENTIONAL LEVELING METHODS.
4. HORIZONTAL POSITIONING WAS PROVIDED USING A TRIMBLE 5700 RECEIVER OPERATING WITH RTK CORRECTION BEING BROADCASTED FROM A TRIMBLE 5700 BASE STATION AT USACE SBC "S, END, 1978".
5. SOUNDINGS ARE IN FEET AND ARE MINUS UNLESS OTHERWISE INDICATED.
6. THIS DRAWING INDICATES GENERAL CONDITIONS AT THE TIME OF SURVEY.

CONTROL DATA					
STATION	NORTHING	EASTING	ELEV.	DESCRIPTION	
N. END	2,646,652.19	1,660,582.43	41.39	USACE	SBC 1978 (STA 58+02.7)
SP-1	2,644,088.25	1,655,477.41	46.40	USACE	SBC 1978 (STA 53+27.3)
DJ-1	2,650,309.04	1,661,821.57	18.47		—
NEW	2,652,477.41	1,653,265.13	46.37		—
EQ-1	2,629,995.41	1,643,787.75	83.07		—
SP-1	2,632,165.12	1,653,477.41	36.47		—
SANDBAG	2,646,634.30	1,662,476.29	206.82	USC & GS	SBC
CLIFF	2,648,978.03	1,662,106.44	250.99		—
C 1/4 COR	2,642,005.75	1,660,981.81	128.25		—
	2,642,501.59	1,661,821.57	18.47		—

PROJECT LIMITS					
CORNER	NORTHING	EASTING	CORNER	NORTHING	EASTING
1	2,642,361.74	1,657,313.54	20	2,644,277.40	1,659,732.
2	2,643,360.32	1,658,008.08	21	2,644,277.40	1,659,734.14
3	2,643,480.14	1,659,255.86	22	2,644,321.50	1,659,601.
4	2,643,951.00	1,659,525.48	23	2,644,321.50	1,658,894.
5	2,644,082.00	1,659,723.50	24	2,644,363.44	1,659,519.
6	2,644,318.05	1,659,900.22	25	2,644,363.44	1,659,442.44
7	2,646,848.26	1,660,647.78	16	2,646,867.23	1,660,431.
8	2,647,045.24	1,660,611.03	17	2,648,493.85	1,660,144.
9	2,650,006.36	1,666,080.76	18	2,649,177.10	1,659,789.
			19	2,682,872.49	1,665,462.

CONTRACT NO. _____	
CONTRACTOR: BUTRA DREDGING COMPANY _____	
CITY: SAN RAFAEL _____	STATE: CA _____
<p style="text-align: center;">ALASKA DISTRICT CORPS OF ENGINEERS ANCHORAGE, ALASKA</p>	
SURVEYED: _____ JSH/CSH _____ DRAWN: _____ CSH _____ CHECKED: _____ JSH _____ SUBMITTED: _____	<p style="text-align: center;">ANCHORAGE, ALASKA PORT OF ANCHORAGE TEST HOLE SURVEY PRE SURVEY SOUTH TEST HOLE SEPTEMBER 17, 2008</p>
RECOMMENDED: <i>JA</i>	APPROVED: _____ <small>CHIEF SURVEYOR - SEASONED BRANCH</small>
PROJECT NUMBER _____	DATE: _____
SURVEY NO. <div style="font-size: 2em; font-family: cursive;">2575-08</div>	SCALE: 1" = 100' SHEET 1 OF 1



## NOTES

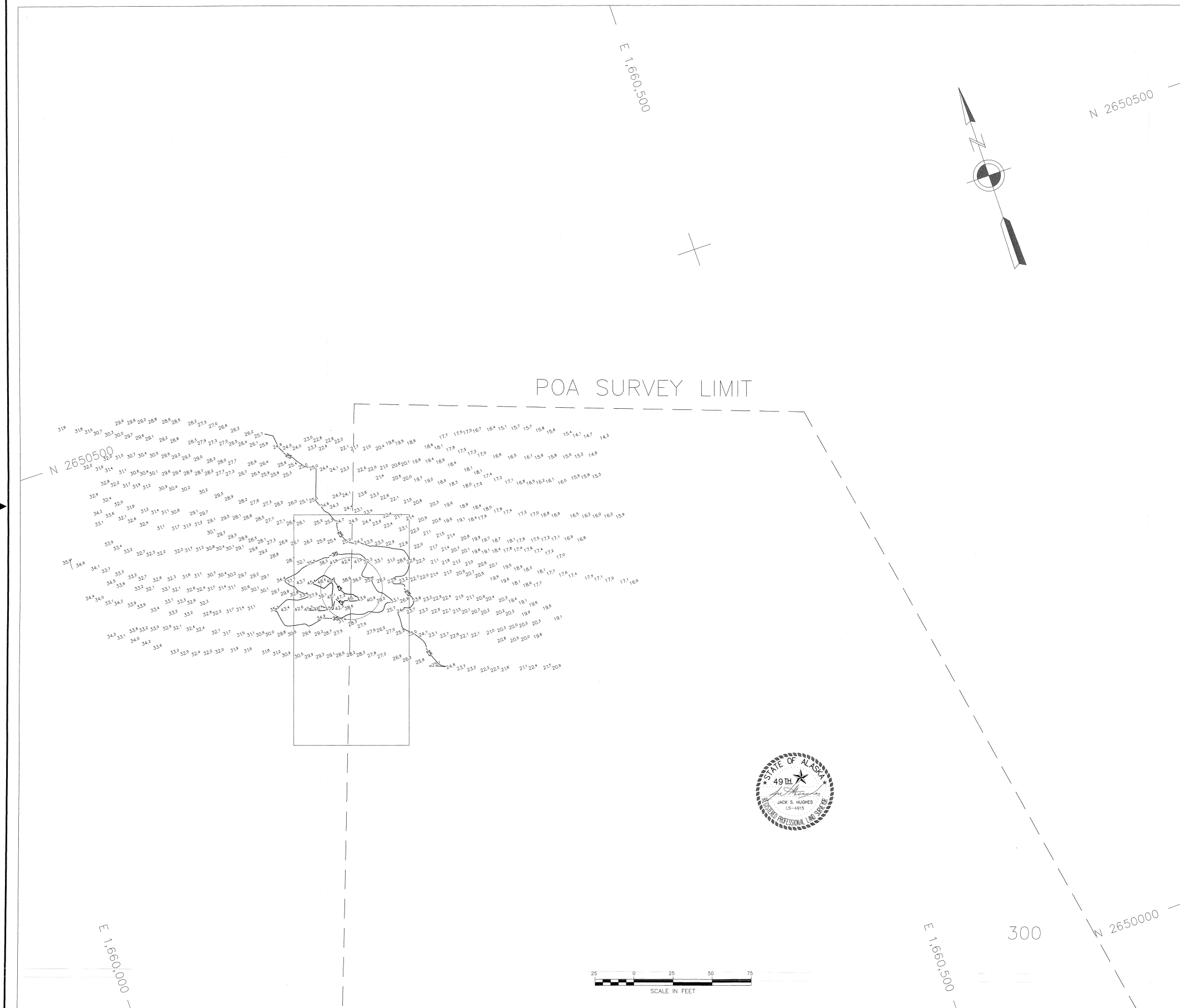
1. HORIZONTAL CONTROL IS ALASKA STATE PLANE, NAD 83, ZONE 4, IN FEET, HOLDING USACE SBC "N, END, 1978" AS N 2,646,652.19, E 1,660,582.43 AND USACE SBC "S, END, 1978" AS N 2,644,298.25 E 1,659,725.47.
2. VERTICAL CONTROL IS IN FEET, REFERRING TO MEAN LOWER LOW WATER (MLLW=0.0'), HOLDING NOAA/NOS TIDAL BENCH MARK LIST DATED 03 NOVEMBER 1999, WITH "BM-16, 1966" GIVEN AS 40.49', "BM-15, 1966" GIVEN AS 37.10', AND "BM-B-75" GIVEN AS 36.78'.
3. SOUNDINGS WERE CONDUCTED ON SEPTEMBER 24, 2008 USING AN INSPERPAGE 448 SINGLE BEAM ECHO SOUNDER WITH A 200KHZ, 3 DEGREE BEAM-WIDTH TRANSDUCER, SOUNDVELOCITY THROUGH THE WATER COLUMN WAS DETERMINED USING AN ODEM DIGIBAR PRO AND A CONVENTIONAL 60" BAR CHECK. TIDE CORRECTION WERE PROVIDED BY A TRIMBLE 5700 RTK RECEIVER AND CHECKED BY CONVENTIONAL LEVELING METHODS.
4. HORIZONTAL POSITIONING WAS PROVIDED USING A TRIMBLE 5700 RECEIVER OPERATING WITH RTK CORRECTIONS BEING BROADCASTED FROM A TRIMBLE 5700 BASE STATION AT USACE SBC "S, END, 1978".
5. SOUNDINGS ARE IN FEET AND ARE MINUS UNLESS OTHERWISE INDICATED.
6. THIS DRAWING INDICATES GENERAL CONDITIONS AT THE TIME OF SURVEY.

CONTROL DATA				
STATION	NORTHING	EASTING	ELEV.	DESCRIPTION
N. END	2,646,652.19	1,660,582.43	41.39	USACE SBC 1978 (STA 58+92.73)
S. END	2,644,258.25	1,660,582.43	40.47	USACE SBC 1978 (STA 33+87.33)
DJ-1	2,650,309.04	1,661,821.57	181.47	—
NEW	2,652,477.41	1,653,265.13	46.47	—
EQ-1	2,629,995.41	1,643,787.75	83.07	—
SP-1	2,632,165.12	1,650,395.14	86.42	—
SANBAG	2,646,634.30	1,662,478.29	20.62	USC & GS SBC
CLIFF	2,648,978.03	1,662,106.44	250.99	—
C 1/4 COR	2,642,005.73	1,660,981.81	128.25	—
SP-1	2,644,301.39	1,660,582.43	38.70	—

PROJECT LIMITS					
CORNER	NORTHING	EASTING	CORNER	NORTHING	EASTING
1	2,642,361.74	1,657,313.54	20	2,644,277.40	1,659,732.11
2	2,643,340.52	1,659,255.88	21	2,644,321.94	1,659,731.34
3	2,643,480.14	1,659,255.86	12	2,644,324.91	1,659,601.01
4	2,643,951.00	1,659,925.60	23	2,643,721.50	1,658,894.14
5	2,644,082.00	1,659,723.60	14	2,646,363.44	1,659,513.91
6	2,644,318.02	1,659,920.20	24	2,642,627.23	1,660,024.23
7	2,646,848.26	1,660,647.16	16	2,646,867.23	1,660,013.31
8	2,647,045.24	1,660,613.05	17	2,648,493.85	1,660,144.14
9	2,650,006.96	1,660,990.76	18	2,649,177.10	1,658,789.28
			19	2,647,492.48	1,660,437.49



CONTRACT NO. _____		DATE _____	
CONTRACTOR: DUTRA DREDGING COMPANY		STATE: CA	
CITY: SAN RAFAEL			
<p style="text-align: center;">ALASKA DISTRICT CORPS OF ENGINEERS ANCHORAGE, ALASKA</p> <p style="text-align: center;">ANCHORAGE, ALASKA PORT OF ANCHORAGE TEST HOLE SURVEYS POST SURVEY SOUTH TEST HOLE SEPTEMBER 24, 2008</p>			
SURVEYED: JSH/CSH		APPROVED:	DATE:
DRAWN: CSH		CHIEF OPERATING-ENGINEER (SIGNED) SCALE: 1" = 100'	
CHECKED: JSH			
SUBMITTED:			
APPROVED:		PROJECT NUMBER	
SURVEY NO. 2577-08		SHEET 1 OF 1	





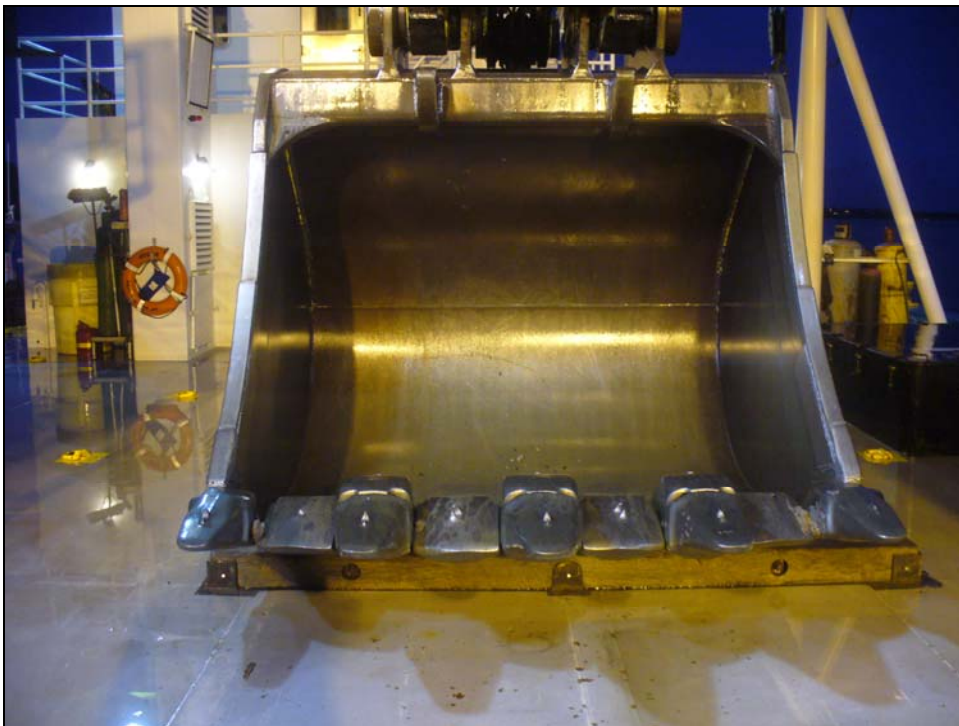


**APPENDIX D**  
**TRIAL DREDGING PHOTOGRAPHS**

Additional photographs of dredging operations.....9 Pages



Photograph 11: McAmis's Megan-Renee dredging barge at trial dredge area 1 (AP-4607).



Photograph 12: McAmis's 10-cubic yard bucket used by the Komatsu PC3000 Aquadigger.



Photograph 13: Poorly graded sand with silt (SP-SM) encountered at trial dredge area 1 (AP-4607).



Photograph 14: Boulders encountered while dredging at trial dredge area 1 (AP-4607).





Photograph 15: Boulder encountered while dredging at trial dredge area 1 (AP-4607).



Photograph 16: Dutra's 20-cubic yard Atlas clam-shell bucket weighing 30,000 pounds.



Photograph 17: Dutra's 20-cubic yard Atlas clam-shell bucket heaped with soft marine deposits at trial dredge area 2 (AP-4611).



Photograph 18: Example of low recovery using the 10-cubic yard Owens bucket at trial dredge area 2 (AP-4611).





Photograph 19: Clayey gravel with sand and cobbles (GC) dredged at trial dredge area 2 (AP-4611).



Photograph 20: Lean clay (CL) dredged at trial dredge area 2 (AP-4611).



Photograph 21: Lean clay (CL) dredged at trial dredge area 2 (AP-4611).



Photograph 22: Lean clay (CL) dredged at trial dredge area 2 (AP-4611).





Photograph 23: Poorly graded gravel with silt, sand and cobbles (GP-GM) dredged at trial dredge area 3 (AP-4590).



Photograph 24: Poorly graded gravel with silt, sand and cobbles (GP-GM) (148.4 pounds per cubic foot) dredged at trial dredge area 3 (AP-4590).



Photograph 25: Clayey gravel with sand and cobbles (GC) dredged at trial dredge area 3 (AP-4590).



Photograph 26: Clayey gravel with sand (GC) (131.0 pounds per cubic foot) dredged at trial dredge area 3 (AP-4590).





Photograph 27: Clayey gravel with sand and cobbles (GC) dredged at trial dredge area 3 (AP-4590).